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PRIOR-ART-DISCLOSED:

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ART-UNIT: 211

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ABSTRACT:

A portfolio optimization process that diversifies model risk by favoring a more diversified portfolio over other portfolios with similar characteristics is provided. According to one aspect of the present invention, a more diverse portfolio may be selected over an initial portfolio in order to diversify model risk with reference to a predetermined diversity budget, defined in terms of expected return, risk, and/or utility. An initial portfolio of financial products is determined from an available set of financial products. One or more dimensions of an error space are searched for an alternate portfolio that is more diverse than the initial portfolio. A cost associated with the alternate portfolio is then calculated by comparing the difference between a characteristic of the initial portfolio and a corresponding characteristic of the alternate portfolio. Finally, the alternate portfolio is selected as the recommended portfolio if the cost is less than or equal to the predetermined diversity budget. According to another aspect of the present invention an intelligent search is performed for a diverse portfolio that meets a predetermined diversity budget. An initial portfolio is determined based upon an available set of financial products. The cost associated with more diversified portfolios compared to the initial portfolio is considered and one of the more diversified portfolios is selected that has an associated cost that is less than or equal to the predetermined diversity budget.

41 Claims, 12 Drawing figures

Previous Doc Next Doc Go to Doc#

L21: Entry 40 of 51 File: USPT Sep 18, 2001

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Detailed Description Text (30):
E(W) is the expected value of wealth

Detailed Description Text (62):
In addition to defining boundaries of the diversification problem in terms of various combinations of stopping conditions, another goal of diversification processing (step 520) is to efficiently search the bounded area (e.g., the error space). FIG. 8 is a flow diagram illustrating the generation of a more diverse portfolio (e.g., steps 624 and 724) according to one embodiment of the present invention. According to the embodiment depicted, diversification is achieved by evaluating additional alternative optimal portfolios, using Equation #1 and #2, for example, under various constraints. At step 810, a maximum exposure is selected. The maximum exposure (e.g., UB from above) defines the maximum percentage of the portfolio's value that may be held in any particular financial product for a particular diversification iteration. Importantly, any of a number of approaches may be employed to select the maximum exposure values for iterations of the diversification processing. In one embodiment, the relationship between cost and maximum exposures is assumed to be monotonic. For example, it may be assumed the cost of implementing an efficient portfolio constrained to a maximum exposure of 80% is greater than the cost of implementing an efficient portfolio constrained to a maximum exposure of 90%. In this manner, a search approach that iteratively lowers the ceiling (as defined by the maximum exposure) to search for a more diverse portfolio may stop once a candidate portfolio exceeds the diversity budget. Similarly, a binary search algorithm may be employed that makes use of the monotonic relationship to select the maximum exposure for the current iteration.

Detailed Description Text (65):
In portfolio 950, financial product 910 represents approximately 90% of the portfolio's total value and financial product 920 represents the remaining 10%. According to this example, in a subsequent iteration illustrated by FIG. 9B, a maximum exposure constraint 941 of 75% is imposed upon the optimization process to arrive at a more diverse portfolio 951. The cost of implementing portfolio 951 as opposed to portfolio 950 is determined to be within the allocated diversity budget; therefore, another iteration may be performed. FIG. 9C represents a more diverse portfolio 952 that results from an even more biting maximum exposure constraint 942. However, the cost, in terms of expected return, risk, and/or utility, of implementing portfolio 952 rather than portfolio 950 is greater than the diversity budget. Therefore, in this example, the recommended portfolio would be portfolio 951 (the most diverse candidate portfolio that stayed within the diversity budget).

Detailed Description Text (66):
FIG. 10 conceptually illustrates an approach for quickly finding a diversified portfolio employing a binary search approach according to one embodiment of the present invention. A maximum exposure 1010 for the first iteration is selected. In this example, the maximum exposure 1010 for the first iteration is 55%

(approximately half way between 100% and a floor 1040 of 10%). If the diversity budget is exceeded in the first iteration, then in the next iteration the maximum exposure value is selected to be between 100% and 55% where the cost is known to be lower. In the example of FIG. 10, the cost of implementing the candidate portfolio identified by the first iteration is less than the diversity budget; therefore, the maximum exposure value for the second iteration 1020 is selected to be approximately half way between the current exposure and the floor 1040. Subsequent iterations continue in this manner by recursively splitting a remaining portion of the maximum exposure range known to meet the budget constraint until one or more stopping conditions are achieved.

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CLAIMS:

8. The method of claim 7, wherein the step of generating a more diverse portfolio than the initial portfolio comprises the steps of:

setting a maximum exposure for any individual financial product of the available set of financial products to a value that is lower than 100%; and

performing a portfolio optimization routine while constraining the holdings in individual financial products of the available set of financial products to the maximum exposure, allowing the first characteristic of the initial portfolio to vary, and holding one or more other characteristics of the initial portfolio

constant.

13. The method of claim 8, wherein the step of modifying the maximum exposure comprises the steps of:

selecting a new maximum exposure value according to a binary search algorithm; and

setting the maximum exposure to the new maximum exposure value.

14. The method of claim 13, wherein a monotonic relationship is assumed between the cost and the maximum exposure, and wherein the step of selecting a new maximum exposure value is based upon both the binary search algorithm and the monotonic relationship.

17. The method of claim 16, wherein the step of generating a more diverse portfolio than the initial portfolio comprises the steps of:

setting a maximum exposure for any individual mutual fund product of the available set of mutual fund products to a value that is lower than 100%; and

performing a portfolio optimization routine while constraining the holdings in individual mutual fund products of the available set of mutual fund products to the maximum exposure, allowing the expected return to vary, and holding a measure of risk associated with the initial portfolio constant.

23. The method of claim 19, wherein the step of modifying the maximum exposure comprises the steps of:

selecting a new maximum exposure value according to a binary search algorithm; and

setting the maximum exposure to the new maximum exposure value.

24. The method of claim 23, wherein a monotonic relationship is assumed between the cost and the maximum exposure, and wherein the step of selecting a new maximum exposure value is based upon both the binary search algorithm and the monotonic relationship.

37. A computer system comprising:

a storage device having stored therein a portfolio optimization routine for simulating portfolio return scenarios for one or more portfolios including combinations of financial products from an available set of financial products;

a processor coupled to the storage device for executing the portfolio optimization routine to select between an initial portfolio and a more diverse portfolio and evaluate a cost associated with implementing the more diverse portfolio rather than the initial portfolio, where:

the initial portfolio is determined with a first maximum exposure constraint;

the more diverse portfolio is determined by imposing a second maximum exposure constraint that limits holdings in any individual financial product of the available set of financial products to a lesser percentage than the first maximum exposure constraint;

the cost reflects the difference between a first expected return associated with the initial portfolio and a second expected return associated with the more diverse portfolio; and

the more diverse portfolio is selected over the initial portfolio if the cost is

less than or equal to a predetermined diversity budget.

Previous Doc Next Doc Go to Doc#